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APPRAISAL OF THE COMPARATIVE PERFORMANCE
OF THE SOVIET RP-17 AND PB-15 ROCK DRILLS

S. S. Smorodin

Laboratory and field tests have been made on the RP-17 and RPM-17 rock drills, made at the Leningrad Pnevmatika Plant, and on the PB-15 and PBM-15 drills of the Tomsk Plant imeni V. V. Vakhrushev. Comparisons were made with reference to the producing plant, and with reference to the type of rock-dust clearing attachment serving the drills: for the first-named of each pair, an air blower; for the second-designated drills, a water washer.

Examination showed the Pnevmatika drills to be better made than the other pair, with the parts corresponding more closely to the specifications of the design. Comparative specifications for all four drills are listed in the table below:

	<u>Pnevmatika Drills</u>		<u>Tomsk Drills</u>	
	<u>RP-17</u>	<u>RPM-17</u>	<u>PB-15</u>	<u>PBM-15</u>
Weight of one-handle model, in kg	16.65	18.5	--	--
Weight of two-handle model, in kg	18.0	19.85	15.7	16.7
Length, in millimeters	600	620	550	520
Weight of striking member, in kg	1.635	1.635	1.500	1.500
Stroke, in mm	44	44	54	54
Diameter of cylinder, in mm	60	60	60	60
Rock-dust clearing attachment	Blower	Washer	Blower	Washer

Laboratory Experiments

Laboratory tests showed that the PB-15 drill exerts greater power in the single stroke than the PB-17, with this power advantage increasing 70 percent as the air pressure is raised from 2.5 to 5 atmospheres. The stroke frequency of the PB-17, however, is greater.

- 1 -

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At nominal pressure, the PB-15 drill exerts 16 percent more power than the PB-17; this difference becomes greater when power exerted per unit of weight is considered. At low pressures, under which the PB-15 requires great expenditure of air per horsepower, the difference is less. At nominal pressure, the Tomsk drills require 33 percent more air than the Pnevmatika drills.

Other tests showed that the turning moment of the PBM-15 drill is 15-35 percent greater than that of the RPM-17, depending on air pressure.

On the basis of weight and power, the above tests would appear to indicate the superiority of the PB-15 drill. These criteria are only applicable, however, in comparing heavy drills of the type mounted firmly on special carriages, tripods, and other devices, and held with constant force against the working face, the power exerted by them being transferred directly to the bit; in evaluating the capacities of hand tools, recoil must be taken into consideration.

Field Experiments

The drills were tested in a granite quarry, on rock with a coefficient of hardness of 14 - 15 by the Protod'yakonov scale. Detachable bits of 38-42 millimeters' diameter, armed with pobedit, were used. Greater importance was attached to the drills' performance on horizontal and slightly inclined drilling, as encountered in underground work, than to their performance in vertical downward drilling, usually carried out in open-pit quarrying.

Horizontal Drilling

On horizontal work, the two drills equipped with water washers were found to be far superior to the air-blower-equipped drills, the RPM-17 being slightly the better of the two, with a 3 percent greater productivity.

Operating at the nominal pressure of 5 atmospheres, the productivity of the RP-17 drill is only 68 percent that of the mean for washer-equipped drills; productivity of the PB-15 is only 59 percent of that mean. Working at the same pressure, the productivity of the RP-17 is about 18 percent more than that of the PB-15.

Both the air-blower-equipped drills require a greater expenditure of air than the washer-equipped ones: for the RP-17, 73 percent more, and for the PB-15, 130 percent more. The washer-equipped drills work best at 4.25-5 atmospheres pressure; the drills having blowers work best at 3.5 atmospheres. At pressures of 3 atmospheres, and below however, the productivity of the washer-equipped drills is lower than that of the drills with air blowers, working at the same pressure.

Indexes were recorded on the productivity of drills per cubic meter of air expended. On horizontal drilling, at nominal pressure, this index was 20 percent greater for the RPM-17 than for the PBM-15; and 70 percent greater for the RP-17 than for the PB-15.

Vertical Drilling

In vertical drilling, productivity of the air-blower-equipped drills is only 3-5 percent below that of the ones having washers, but their expenditure of bits is greater. Evaluated according to plant, the Tomsk drills are slightly less productive than those made at the Pnevmatika Plant, but require a greater expenditure of air. To perform an equal volume of work, the compressor for the PB-15 and PBM-15 drills should be 20-25 percent more powerful than the one used for the RP-17 and RPM-17 drills.

- 2 -

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To get maximum productivity and to expend the minimum amount of air per linear meter of quarried material, the working pressure for the drills should be raised to 6 atmospheres.

Conclusions

The light drills of the Pnevmatika Plant are the best presently available. In horizontal and inclined drilling, the PB-15 drill of the Tomsk Plant is not economical and has a low productivity.

In underground work, where drilling is chiefly horizontal, drilling must be accompanied by continuous washing. Under the same conditions, air pressure for the drill must be at least 4.25 atmospheres.

In open-pit work, where downward vertical drilling prevails, washing is not essential if the expenditure of bits is not taken into account. Air pressure should be at least 5 atmospheres.

The Pnevmatika Plant must work toward improvement of its products. In particular, the turning moment of the drills must be increased, though without reducing other indexes; the oil reservoir must be enlarged; and the design of the bit holder must be improved. It may be added that the plant has already undertaken a series of measures to improve its drills, and has succeeded in somewhat increasing their turning moments.

Special study must be made of the recoil of hand tools, which is the main factor in limiting their effectiveness.

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- 3 -

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